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**Qiang Du\*** ([qdu@math.psu.edu](mailto:qdu@math.psu.edu)), Department of Mathematics, Penn State University, University Park, PA 16802. *Analysis and approximations of nonlocal balance laws and peridynamics.*

We discuss some nonlocal balance laws and in particular the peridynamic models. A vector calculus for nonlocal operators is shown to give a foundation to pose such nonlocal models with reduced regularity requirements. We address some basic well-posedness issues and explore connections with local models. We also study finite dimensional approximations of nonlocal models, such as convergence, a priori and a posteriori error analysis and conditioning of nonlocal stiffness matrices. This talk is based on:

- 1 Q. Du and K. Zhou, Mathematical analysis for the peridynamics nonlocal continuum theory, ESIAM: M2AN, 2011.
- 2 K. Zhou and Q. Du, Mathematical and numerical analysis of the linear peridynamic models with nonlocal boundary conditions, SINUM, 2010.
- 3 Q. Du, M. Gunzburger R. Lehoucq and K. Zhou, A nonlocal vector calculus, nonlocal volume-constrained problems, and nonlocal balance laws., Sandia Report, 2010.
- 4 Q. Du, M. Gunzburger, R. Lehoucq and K. Zhou, Analysis and approximation of nonlocal diffusion problems with volume constraints, Sandia Report, 2011.
- 5 Q. Du, L. Ju, L. Tian and K. Zhou, A posteriori error analysis of finite element method for nonlocal diffusion problems and peridynamic models, preprint, 2011.

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